

**CULTURE OF DELTA SMELT, *Hypomesus transpacificus*, IN SUPPORT OF
ENVIRONMENTAL STUDIES AND RESTORATION
< University of California, Davis >**

I. Executive Summary

I. a. Project Description and Primary Biological and Ecological Objectives

The on-going Delta Smelt Culture Project is currently funded by CALFED, for the first year of a three-year program (funding ends June 30, 1999). The project is on track in developing a functional culture system for delta smelt; a threatened species endemic to the Sacramento - San Joaquin Estuary. This species is considered by CALFED to be a "high priority at risk species" (ERP Vol. I and II, 1999), and is included in the list of highest priority species dependent on the Delta (CALFED PSP, Goal 1).

All objectives outlined for the first year's delta smelt culture work (Phase 1, in progress) have been met or exceeded and we are on schedule for spring spawning and larval rearing trials. Renewed funding for our program will enable us to evaluate the important parameters of temperature and rearing-tank size on smelt performance, and to provide summary evaluation of system performance, culture protocols and methodologies.

The main objectives of the Delta Smelt Culture Project are to aid in species restoration by:

- Developing a reliable and technically feasible culture system for all life stages of delta smelt.
- Initiating the supply of live animals for testing in laboratory and field research.
- Providing data and observations on the development and behaviors of delta smelt.
- Creating a preserved developmental series of eggs through juvenile stages for comparisons to field fish, provides a standard for evaluating on-going habitat restoration in the delta.
- Creating a refuge population and, by procuring wild sub-adults for broodfish each fall, minimizing genetic changes. There are no plans to re-stock delta smelt.

A supply of cultured smelt is desired by a number of State and Federal Agencies:

This year we are supplying smelt for two UC-Davis projects: the fish treadmill project of Dr. Cech and associates, and the assessment of delta smelt health from various delta areas directed by Dr. Bennett and associates (funding from CALFED). This latter group plans to conduct contaminant exposure studies with this native species in 1999 and 2000.

In 1998 we supplied embryos to Dr. Huang (Dept. of Fish and Game) for toxicity testing of an herbicide (Komeen^R) used to control an exotic aquatic macrophyte, *Egaria densa*. Post-spawn adult smelt were supplied to Dr. Cech's group (UC-Davis) for testing in the fish treadmill.

In the near future a large supply of larval and juvenile smelt is desired by the US Bureau of Reclamation (US Bureau) and the California Department of Water Resources (DWR) for testing improvements in fish screen design and fish salvage operations, at the Central Valley Project (CVP) and the State Water Project (SWP). These agencies have funded this project in past years.

I. b. Budget Costs

Budgets have been prepared with both State (10%) and Federal (44.5%) funds overhead. Project total cost for funding Phase 2 and 3 with state funds is \$431,606.00 (\$559,446.00 Fed. cost). Broken down by year, cost to the State for the Phase 2: 1999-2000 is \$212,253.00 (\$275,059.00 Fed. cost), and \$219,353.00 (\$284,387.00 Fed cost) for Phase 3: 2000-2001. The major part of the budget supports three key personnel working full-time at the delta smelt culture facility. Their previous experience and technical skill are critically important in developing methods for culture and breeding of delta smelt.

I. c Adverse and Third Party Impacts

There are no foreseeable adverse or third party impacts by this small project located on State land.

I. d. Applicant Qualifications

Dr. Serge Doroshov has expertise in developmental biology and hatchery technology of cultured fish, including sturgeon, striped bass, catfish, trout, and marine species. Together with graduate students, he has developed a delta smelt prototype culture-system at UC-Davis and has characterized sexual maturation, gametogenesis, and early development in delta smelt. **Dr. Joan Lindberg** conducted her graduate studies on salmon metamorphosis and feeding behavior in sturgeon larvae. She led an independent pilot project on delta smelt spawning and culture at the SWP facilities in Byron before expanding the UC-Davis effort at that site. **Dr. Bradd Baskerville-Bridges** conducted his thesis research on the development of fish culture techniques for cod at the University of Maine before joining the smelt project. **Joel Van Eenennaam** has extensive experience in the breeding and culture of various fish species, including sturgeon and delta smelt; he will administer and track funds. **Marade Walston** has completed a BS Degree in Wildlife and Fisheries from UC-Davis and has gained experience in spawning, and rearing delta smelt.

I. e. Monitoring, Data Evaluation, and Scope of Work

This project is not directly related to monitoring and data evaluation programs. Some of the material of this project can be used for bio-monitoring program standards. For example, developmental charts for delta smelt (accounting for temperature effect) can be used in the analysis of captured larvae, and juveniles from various locations to examine dispersal, growth, and development in the wild population.

Scope of work includes the following tasks:

Phase 1: July 1998 - June 1999 (current CALFED contract B81581)

In the current phase of the project (previous funding cycle) we are completing the following tasks: (1) Site improvements; (2) Spawn technique development, initiation of rotifer culture and supply of eggs to researchers; (3) Larval culture development, and supply of larvae to researchers; (4) Post-larval fish collection; (5) Year-end report.

Phase 2: 1999 - 2000

Approval of the current proposal will enable work on the following tasks: (1) Site improvements and broodfish capture; (2) Broodfish, rotifer, and Artemia cultures; (3) Improve larval fish culture -test effect of temperature; (4) Capture of wild post-larvae; (5) Rear cultured juvenile fish; (6) Year-end report preparation and dissemination.

Phase 3: 2000 - 2001

The third year effort will include the following tasks: (1) Site improvements and broodfish capture; (2) Broodfish, rotifer, and Artemia cultures; (3) Improve larval fish culture -test increased scale production-system; (4) Capture of wild post-larvae; (5) Rear cultured juvenile fish in larger, production, system; (6) Prepare 3-year summary of smelt culture system: design, protocols, performance, and smelt biology. Prepare manuscript for publication.

I. f. Local Coordination with other Programs and Compatibility with CALFED objectives

Interest in the proposed study has been voiced from the Department of Water Resources, Federal Bureau of Reclamation, Department of Fish and Game, Interagency Ecological Program, and the University of California-Davis.

Restoration of delta smelt is listed by CALFED as a Priority Group I Objective under Goal 1: Endangered Species (Strategic Plan for Ecosystem Restoration, Draft 2/99). The document maintains that delta smelt, and many of the Priority Group I fishes, are recoverable through restoration of the Delta and Suisun Bay areas. Restoration involves both improvements in physical properties of the Delta, and improvements in information to allow better management of the ecosystem (Strategic Plan, p. 32). The current project is designed to contribute to the latter. That is, by supplying delta smelt life stages to other research projects, and by recording fundamental information on delta smelt biology, this project contributes to restoration and management efforts in the Delta ecosystem.